Space Weather Technical Forecast

Issued on Tuesday, 10 May 2022 at 01:29 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of G1 on 10 May. Slight chance of R1/R2 radio blackouts throughout.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been Low, with only isolated low level C-class flares. There are currently six regions on the visible disc, with the most significant of these AR3004 (Dai/Beta-Delta) in the south central disc. There is potentially a group of four regions close to the southeastern limb, although only one of these has been numbered. None of these regions have been noticeably active with 3004 is expected to rotate across the western limb in the next 12 hours. Several long filaments are on the visible disc, but no Earth-directed CMEs have been observed in the last 24 hours.

Solar Wind / Geomagnetic Activity: The solar wind as observed at L1, has been ambient, around 310km/s, with density generally below average. Total interplanetary magnetic field strength has been weak, with the north-south component, Bz also varying weakly. Phi angle started negative (towards the Sun) but rotated to be mainly positive from around 09/0800UTC. Resultant geomagnetic activity has been mainly Quiet, with one Unsettled interval.

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) has been at background levels through the last 24 hours. High energy electron flux (greater than 2MeV) has been at background. Electron fluence has been below the Active (1e8 integrated pfu) threshold with a declining trend, falling to 1.24e6 integrated pfu at 09/2100UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Solar activity is expected to be mainly Low, with a slight chance of Moderate activity. This is mainly due to an evolving prominent region close to south-centre disc.

Solar Wind / Geomagnetic Activity: A CME which left the Sun on 06 May is due to directly impact the Earth during 10 May. A coronal hole high speed stream is also expected to connect with the Earth on 10 May. There is a slight chance of Active or G1 Minor Storm intervals on 10 May due to the possibility of either feature affecting the Earth, or due to a mixture of the two. Residual effects are then possible on 11 May, with a slow return to Quiet or Unsettled conditions on 12 and 13 May.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is at background levels, with a daily very slight chance of a solar radiation storms due to AR3004 approaching the western limb and the rotation of AR3005 into the western hemisphere. The high energy electron flux (greater than 2MeV) is forecast to remain at predominantly weak levels. The forecast geomagnetic activity is then likely to suppress the electron flux through much of the period. 24-hour fluence is now expected to remain below the Active threshold.

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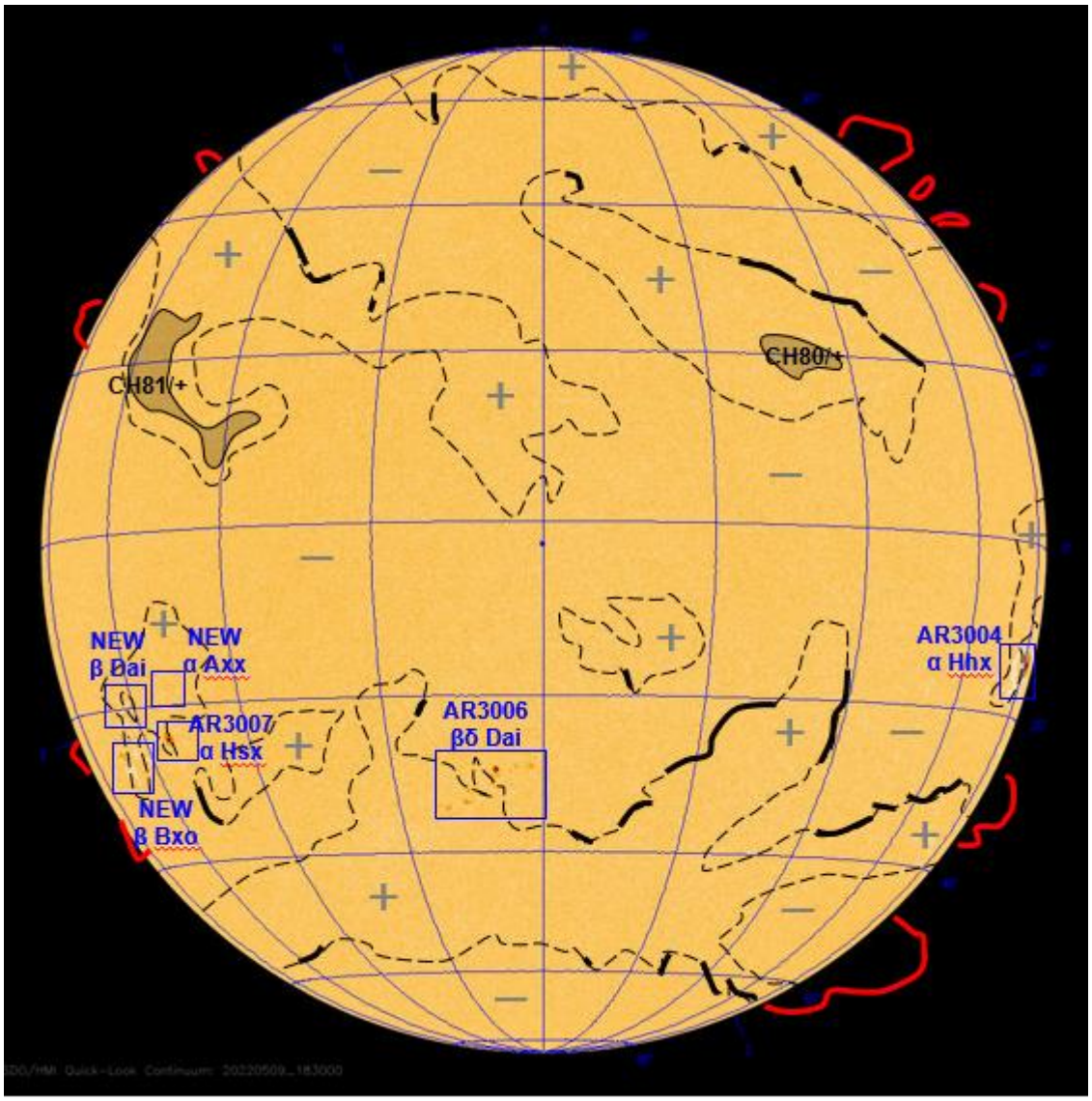
Figure 1. Solar Analysis Valid 09/2000UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

A CME which left the Sun on 06 May is due to arrive at Earth on 10 May, with Enlil suggesting that this would be a direct impact.

The next coronal hole to affect the Earth will be coronal hole 80 in the northern hemisphere, with the high speed stream from this feature expected to connect with the Earth on 10 May. There is uncertainty in the timing of the connection, due to Enlil forecasting wind speeds above those observed. However there is a chance of a concurrent arrival of the CME and high speed stream.

Geomagnetic activity is expected to start Quiet, but with a chance of Active or G1/Minor Storm intervals on 10 and 11 May due to the potential onset and then residual effects of the CME and high speed stream. A return to Quiet to Unsettled conditions is then possible through 12 and 13 May.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	30	20	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
07/0800	Partial	Filament eruption	NE quadrant	580km/s	After 10/1500	Possible later than forecast by Enlil

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Figure 2: MOSWOC Enlil showing forecast potential CME arrival time.

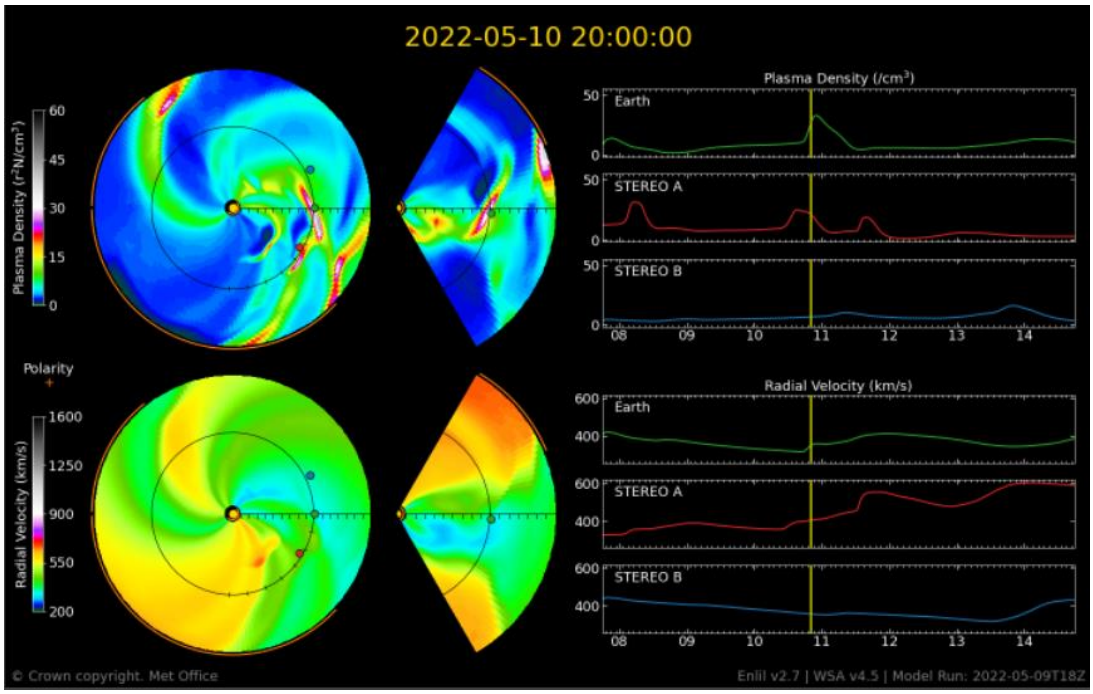
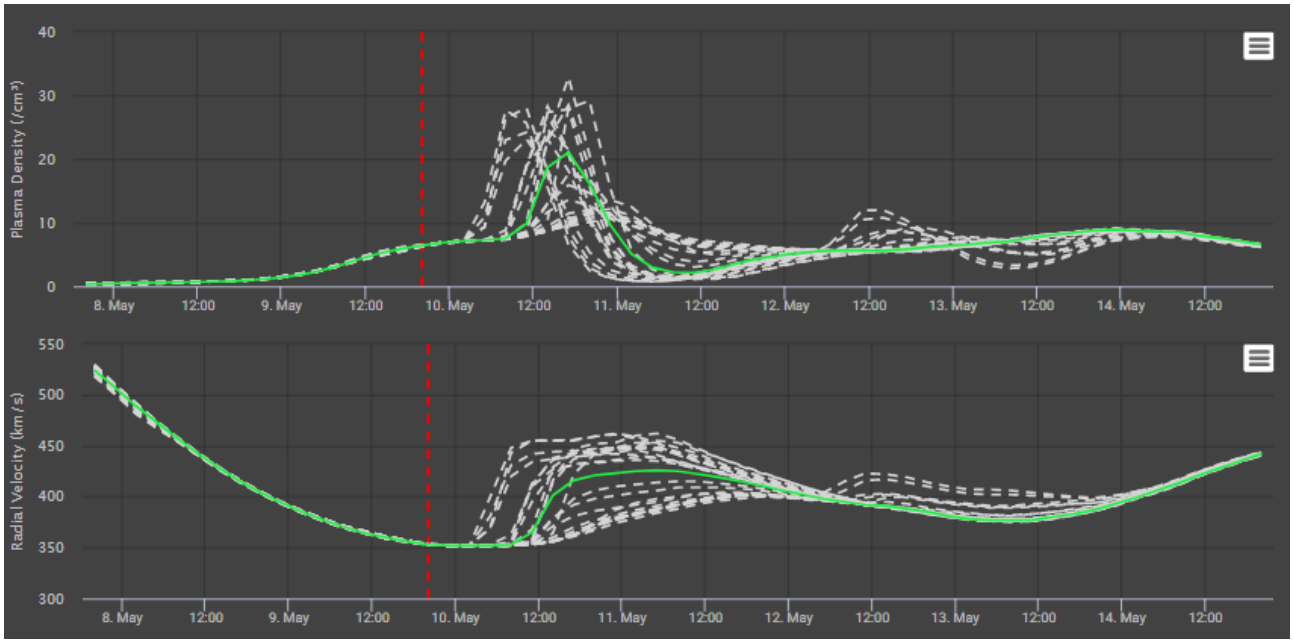


Figure 3: MOSWOC Enlil Ensemble showing potential range in arrival times



Radio Blackouts - X-Ray Flares:

Two regions close to the western limb have now rotated from view, with one also close to the southwest limb.

The most distinct region is AR3006 in the south-centre disc. This region has a pronounced delta spot in the lead group but has not yet produced significant activity. An emerging region on the southeast limb, appears to be four separate region, with only one of these numbered. Analysis of

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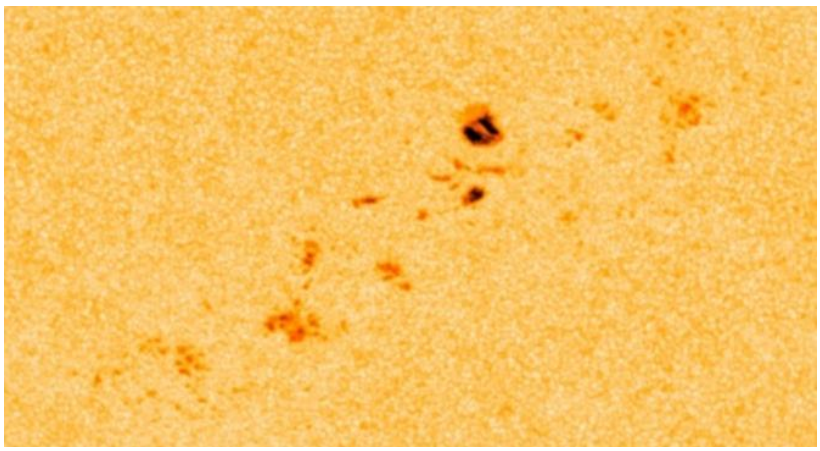
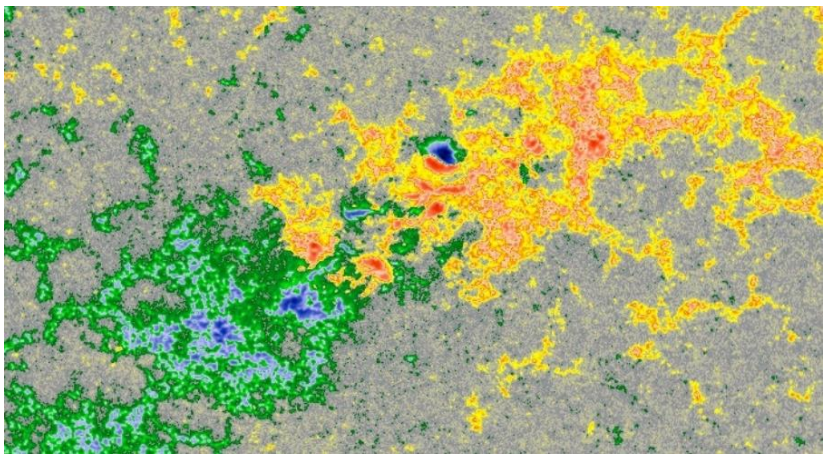
the area suggests little relation between the regions in terms of magnetic looping, although this will be reviewed. Currently none of these regions pose a significant flare risk.

Overall solar activity is expected to be Low, with a slight chance of Moderate activity, mainly from the largest region in centre disc.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	20	20	20	20
Very Active	R3 to R5 X Class	No	5	3	3	3

Figure 4: AR3006 (Dai/Beta-Delta) on SDO Intensitygram and magnetogram imagery. The delta region is clearly visible in the northwestern leader spot.





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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as measured by GOES-16 at GEO is at background levels, and is most likely to remain so through the next four days.

There is a daily slight chance of proton storms, mainly due to the approach of AR3004 towards the western limb but also now AR3005. Despite this slight risk, it should be noted that none of the current disc have a history of producing any proton response at GOES16.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) is expected to be at mainly background levels through the forecast period. This is due to an initial ambient solar wind, followed by increased solar wind speeds which could displace the belts from their orbits and geomagnetic activities which could suppress the count of electrons within the belts.

Based on the analysis of potential electron flux, electron fluence is expected to be well below the Active (1e8 integrated pfu) threshold.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	5	5	5	5
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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